CLAIMS

What is claimed is:

1. A method for fabricating an input pinion for an automotive differential, the method comprising:

providing a tubular shaft;

roll forming the tubular shaft to define a plurality of spline teeth and a set of threads;

forging a pinion, the pinion including a plurality of teeth, each tooth being formed in the forging step to a size that is larger than a desired tooth size by an amount that is less than or equal to about 0.4 inch;

performing at least one of a machining, grinding operation and a honing operation to machine the teeth of the pinion to the desired tooth size;

forming a round hole in the pinion;

pressing a cylindrical end of the tubular shaft into the hole in the pinion to fixedly couple the pinion and the tubular shaft to one another;

induction heating the pinion and the tubular shaft to heat-treat both a plurality of teeth that are formed on the pinion and at least one portion of the tubular shaft; and

laser welding the tubular shaft to the pinion.

2. A method for fabricating an input pinion for an automotive differential, the method comprising:

providing a shaft;

forging a pinion, the pinion including a plurality of teeth, each tooth being formed in the forging step to at least a near-net size;

forming a hole in the pinion;

pressing an end of the shaft into the hole in the pinion; and

securing the shaft to the pinion.

3. The method of Claim 2, wherein the shaft is secured to the pinion with a laser weld.

4. The method of Claim 3, wherein the laser weld has a depth of about 0.3 inches.

5. The method of Claim 2, further comprising roll forming a set of threads onto the shaft, the set of threads being formed on an end of the shaft opposite the end on which the pinion is mounted.

6. The method of Claim 2, wherein each tooth on the pinion is forged to a size that is larger than a desired tooth size by an amount that is less than or equal to about 0.04 inch.

7. The method of Claim 6, wherein the amount by which each tooth on the pinion is forged larger than the desired tooth size is less than or equal to 0.02 inch.

8. The method of Claim 2, further comprising performing at least one of a grinding operation and a honing operation to machine the teeth of the pinion to the desired tooth size.

9. The method of Claim 2, further comprising induction heating the pinion and the shaft to heat-treat both the teeth that are formed on the pinion and at least one portion of the shaft.

10. The method of Claim 9, wherein the pinion and the shaft are heat-treated after the shaft has been pressed into the hole in the pinion.

11. The method of Claim 9, wherein a portion of the pinion that is located radially inward of the teeth is not hardened in the induction heating operation.

12. The method of Claim 9, further comprising mounting a bearing to the portion of the shaft.

13. The method of Claim 2, wherein the shaft is a hollow tube.

14. The method of Claim 2, wherein the shaft is formed of a first material and the pinion is formed of a second material that is different than the first material.

15. The method of Claim 14, wherein the second material comprises: about 0.38% to about 0.44% C, about 1.35% to about 1.65% Mn, about 0.03% maximum P, about 0.04% maximum S, about 0.15% to about 0.35% Si, about 0.08% to about 0.12% V; about 0.01% to about 0.02% Ti; and about 130 ppm to about 170 ppm N.

16. The method of Claim 14, wherein the first material comprises: about 0.36% to about 0.44% C, about 1.35% to about 1.65% Mn, about 0.15% to about 0.35% Si; and about 0.035% to about 0.085% V.

17. The method of Claim 2, wherein the hole in the pinion is round.

18. The method of Claim 2, wherein the end of the shaft is formed with a shape that corresponds to a shape of the hole.

19. A method for fabricating an input pinion for an automotive differential, the method comprising:

providing a shaft;

roll forming a set of splines and a set of threads onto the shaft;

forging a pinion, the pinion including a plurality of teeth, each tooth being formed in the forging step to at least a near-net size;

forming a hole in the pinion;

pressing a end of the shaft into the hole in the pinion; and

laser welding the shaft to the pinion.

20. The method of Claim 19, wherein each tooth on the pinion is forged to a size that that is larger than a desired tooth size by an amount that is less than or equal to about 0.04 inch.

21. The method of Claim 20, wherein the amount by which each tooth on the pinion is forged larger than the desired tooth size is less than or equal to 0.02 inch

22. The method of Claim 19, further comprising performing at least one of a machining, grinding, and a honing operation to machine the teeth of the pinion to the desired tooth size.

23. The method of Claim 19, further comprising induction heating the pinion and the shaft to heat-treat both the teeth that are formed on the pinion and at least one portion of the shaft.

24. The method of Claim 19, wherein the pinion and the tubular shaft are heat-treated after the shaft has been pressed into the hole in the pinion.

25. The method of Claim 19, wherein a portion of the pinion that is located radially inward of the teeth is not hardened in the induction heating operation.

26. The method of Claim 19, further comprising mounting a bearing to the portion of the shaft.

27. The method of Claim 19, wherein the hole in the pinion is round.

28. The method of Claim 27, wherein the end of the shaft is formed with a shape that corresponds to a shape of the hole.

29. A method for fabricating an input pinion for an automotive differential, the method comprising providing a shaft, forging a pinion with a plurality of teeth such that each tooth is formed to at least a near-net size, forming a hole in the pinion, pressing an end of the shaft into the hole in the pinion, and securing the shaft to the pinion.